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Editorial

Special issue on distributed computing and artificial intelligence systems

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This Neurocomputing special issue presents the post-proceedings of the International Conference on Practical Applications on Agents and Multi-Agent Systems (PAAMS 2014) held in Salamanca in June 4–6th, 2014. PAAMS provides an international forum to present and discuss the latest scientific developments and their effective applications, to assess the impact of the approach, and to facilitate technology transfer. PAAMS started as a local initiative, but has since grown to become the international yearly platform to present, to discuss, and to disseminate the latest developments and the most important outcomes related to real-world applications. It provides a unique opportunity to bring multi-disciplinary experts, academics and practitioners together to exchange their experience in the development and deployment of Agents and Multi-Agent Systems. PAAMS intends to bring together researchers and developers from industry and the academic world to report on the latest scientific and technical advances on the application of multi-agent systems, to discuss and debate the major issues, and to showcase the latest systems using agent based technology. It will promote a forum for discussion on how agent-based techniques, methods, and tools help system designers to accomplish the mapping between available agent technology and application needs. Other stakeholders should be rewarded with a better understanding of the potential and challenges of the agent-oriented approach.

The conference is organized by the Bioinformatics, Intelligent System and Educational Technology Research Group (http://bisite.usal.es/) of the University of Salamanca. This special issue is based on selected, expanded and significantly revised versions of the best papers presented at the conference:

In the first paper, Saied et al. present an Artificial Neural Network (ANN) algorithm to detect DDoS attacks based on specific characteristic features (patterns) that separate DDoS attack traffic from genuine traffic. The key objective of a Distributed Denial of Service (DDoS) attack is to compile multiple systems across the Internet with infected zombies/agents and form botnets of networks. Such zombies are designed to attack a particular target or network with different types of packets. The infected systems are remotely controlled either by an attacker or by self-installed Trojans (e.g. roj/Flood-IM) that are programmed to launch packet floods. Within this context, the purpose of this paper is to detect and mitigate known and unknown DDoS attacks in real time environments.

Omatu and Yano propose a new construction of an electronic nose (E-nose) system based on a neural network. They focus on a competitive neural network by the learning vector quantization (LVQ). Various odors are measured with an array of many metal oxide gas sensors. After reducing noises from the odor data which are measured under different concentrations, they take the maximum values among the time series data of odors. As the odors are affected by concentration levels, a normalization method is used to reduce the fluctuation of the data and reorder the measurement data according to the concentration levels to make the features invariant with the concentration levels. Those data are used to classify the various odors of tees and coffees. The classification results are about 96% in case of four kinds of tees and about 89% for five kinds of coffees.

Teranishi presents a stable learning method of the neural network tomography, in case of asymmetrical few view projection. Teranishi focus in the fact that the neural network collocation method (NNCM) is one of effective reconstruction tools for symmetrical few view tomography, but in cases of asymmetrical few view, the learning process of NNCM tends to be unstable and fails to reconstruct appropriate tomographic images. The unstable learning problem of NNCM is faced off in this article by introducing a coarse reconstructed image in the initial learning stage of NNCM. The numerical simulation with an assumed tomographic image shows the effectiveness of the proposed method.

Melo-Cisneros proposes a Gaussian-PSO-based structural learning and fuzzy reasoning to optimize the weights and structure of a Feed Forward Neural Network. Recently, research studies have introduced evolutionary algorithms to improve the performance of different neural networks. The PSO is a population-based algorithm that has the advantage of faster convergence. However, the total number of the weights in the Neural Network determines

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the size of each particle, therefore the size of the network structure is computationally time consuming. The proposed method improves the learning and removes the stress by eliminating the necessity of determining a detailed network.

Pimenta et al. target the problem of fatigue, by the observation of the individual's interaction with the computer. They show that this interaction changes with the onset of fatigue and that these changes are significant enough to support the training of a neural network that can classify mental fatigue in real time. Fatigue, especially in its mental form, is one of the most worrying health problems nowadays. It affects not only health but also motivation, emotions and feelings and has an impact both at the individual and organizational level. Fatigue monitoring and management assumes thus, in this century, an increased importance, that should be promoted by private organizations and governments alike. The main outcome of this work is the development of non-invasive systems for the continuous classification of mental fatigue that can support effective and efficient fatigue management initiatives, especially in the context of desk jobs.

Ferreira-Cruz et al. propose the use of a bee-inspired algorithm, named cOptBees, plus a heuristic to automatically select the number, location and dispersions of basis functions to be used in RBF networks. cOptBees was originally designed to solve data clustering problems and the prototypes determined by the algorithm will be selected as the centers for the RBF network. The presented approach, named BeeRBF, is used to solve classification problems and is evaluated both in terms of the decision boundaries generated and classification accuracy. The performance of BeeRBF was compared with that of k-means, random center selection and some other proposals from the literature. The results show that BeeRBF is competitive and has the advantage of automatically determining the number of centers to be used in the RBF network.

Pinto et al., present the application of a Support Vector Machines (SVM) based approach to provide decision support to electricity market players. This strategy is tested and validated by being included in ALBidS and then compared with the application of an Artificial Neural Network (ANN), originating promising results: an effective electricity market price forecast in a fast execution time. Energy systems worldwide are complex and challenging environments. Multi-agent based simulation platforms are increasing at a high rate, as they show to be a good option to study many issues related to these systems, as well as the involved players at act in this domain. The authors integrate the existing MASCEM (Multi-Agent System for Competitive Electricity Markets), which simulates the electricity markets environment, with ALBidS (Adaptive Learning Strategic Bidding System) that works as a decision support system for market players. The ALBidS system allows MASCEM market negotiating players to take the best possible advantages from the market context. The proposed approach is tested and validated using real electricity markets data from MIBEL – Iberian market operator.

Galeshchuk explores the use of ANNs for the economic and defines a evaluation case study for the foreign exchange market data. For the experiments, panel data of the exchange rates (USD/EUR, JPN/USD, USD/GBP) are examined and optimized to be used for time-series predictions with neural networks. In this stage the input selection, in which the processing steps to prepare the raw data to a suitable input for the models are investigated. The best neural network is found with the best forecasting abilities, based on a certain performance measure. A visual graphs on the experiments data set is presented after processing steps, to illustrate that particular results. The out-of-sample results are compared with training ones.

In the last paper, González-Bedia et al. discuss about the permanent increasing in the popularity of videogames in the last decade and present a particular case of the “exploration vs exploitation” dilemma, a paradox that appears in numerous situations where systems needs being adaptable and learnable at the same time and solutions of the dilemma are built evolving balances between parts. They propose how a good strategy for optimizing the behavior of a team of bots (with roles between members and communication skills between each other) in the “capture the flag game” domain, could be designed and analyzed using a combination between swarming optimization techniques and mathematical analysis based in Markov models in order to improve the standard strategies that videogames use. The environment used to test the proposed model will be the Unreal Tournament virtual world.

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